(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 378 721 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent: 10.04.1996 Bulletin 1996/15

(51) Int. Cl.[6]: B65H 19/16

(21) Application number: 89100876.5

(22) Date of filing: 19.01.1989

(54) Splicing system

Verbindungssystem für Bahnen

Système de raccordement de bandes

(84) Designated Contracting States:
DE ES FR GB

(43) Date of publication of application:
25.07.1990 Bulletin 1990/30

(73) Proprietor: MITSUBISHI JUKOGYO KABUSHIKI KAISHA
Tokyo 100 (JP)

(72) Inventor: Sato, Hiroshi
c/o Mihara Machinery Works of
Mihara-shi Hiroshima-ken (JP)

(74) Representative: Henkel, Feiler, Hänzel & Partner
Möhlstrasse 37
D-81675 München (DE)

(56) References cited:
WO-A-87/02019
FR-A- 2 222 294
GB-A- 2 056 953
FR-A- 2 117 449
FR-A- 2 341 507
US-A- 4 009 814

BEST AVAILABLE COPY

EP 0 378 721 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

BACKGROUND OF THE INVENTION:

Field of the Invention:

The present invention relates to a splicing system, which is applicable to a control section for a dancer roll moving speed of a corrugate machine, a printing machine provided with an intermittent feeding device of a continuous sheet, a dancer roll section in a winder, and the like.

Description of the Prior Art:

A general construction of one example of a splicing system for use in a corrugate machine in the prior art is shown in Figs. 4 and 5. Principal components of the illustrated apparatus are a raw material sheet feeder section 17, a sheet splicer section 3 and a dancer roll section 1. The raw material sheet feeder 17 is a device, in which a rolled sheet 18 consisting of a raw material sheet is rotatably supported via a shaft by a mill roll stand 15 and the sheet is successively rewound and fed in accordance with a necessary feed rate for manufacturing a corrugated cardboard sheet. The subsequent sheet splicer 3 is a device, in which in the case of order change or in the case where an old sheet 18 has been used up, a continuous sheet is formed by connecting the old sheet 18 to a new sheet 18'. The dancer roll section 1 is a section operable in such manner that since the splicing work is carried out while the feeding of the raw material sheet is kept stopped, a length of raw material sheet spent during that splicing work and to be supplemented later is preliminarily stored in the section so that the corrugated cardboard sheet can be manufactured continuously.

Now description will be made briefly on the method (procedure) for splicing. At first, a tip end of a new sheet 2' paid out of a rolled sheet 18' on a mill roll stand 15, has a double-face adhesive tape 19 applied onto its surface after a cutting treatment, its back surface is sucked and held by a press-adhesion bar 20', and stands by under the condition shown in Fig. 5. On the other hand, with regard to the running old sheet 2, an accelerating roll 4 is decelerated by carrying out speed control of a motor 16, the sheet feeding speed is reduced by a braking action of a press roll 24 which pinches the sheet 2 jointly with the accelerating roll 4, further in a sheet stopper section 21 the sheet 2 is pinched by paired bars to be perfectly stopped, and then the stopped old sheet is spliced with the new sheet 2' via the double-face adhesive tape 19 by means of the press-adhesion bar 20'. The thus spliced sheet is pulled by the pinching rotation of the acceleration roll 4 and the press roll 24, and is fed to the dancer roll section 1. After predetermined acceleration, the acceleration roll 4 feeds the sheet to the dancer roll section 1 at a somewhat faster speed than the rate of ejecting the sheet from the dancer roll section 1 and consuming it at the next step of the process, and thus it functions to supplement the stocked amount of sheet that was consumed during the splicing operation. It is to be noted that in Figs. 4(a) and 4(b), a motor 23 always continues to rotate at a predetermined speed for moving a pair of bearings 14 for a tension roll 5 connected to chains 13 at one location via a powder clutch 11 and sprockets 12, and thereby a proper tension is applied to the sheet being ejected. In the above-mentioned powder clutch 11 which is one kind of electromagnetic disc clutches, finely crushed dry magnetic particles are filled in the space between clutch elements, and a predetermined torque can be set by regulating a current flowing through the powder. It can operate also as a safety device such that in the event that an excessively large torque has been exerted upon the clutch elements, they would slip relative to each other and absorb the exerted torque.

The splicing system in the prior art is constructed and operates in the above-described manner, hence upon sheet splicing work, in the event that the accelerating roll 4 and the press roll 24 have been momentarily decelerated or stopped, as the sheet speed for ejecting the sheet from the dancer roll section 1 to the next step of the process is a constant speed, the tension roll 5 would be pulled back against the inertia of the dancer roll section 1 and the tension roll 5, and so, abrupt change of the sheet tension would appear in the running sheet as shown in Fig. 3(c). On the contrary, after the sheet splicing work, as the feed speed of the sheet 2 is accelerated by the acceleration of the accelerating roll 4, it is necessary to decelerate the moving speed of the tension roll 5 in the pull-back direction, that is to accelerate the moving speed in the normal direction. However, this system had structural shortcomings that if this deceleration (i.e., acceleration in the normal direction) is slower than the acceleration of the sheet 2, the sheet 2 would slacken, while if the feed speed of the sheet 2 is insufficient, the dancer roll would continuously run in the pull-back direction and would strike against a limit stopper, resulting in break of the sheet 2.

In summary, in the above-described sheet splicing system in the prior art, since the splicing between new and old sheets is carried out in the course when a corrugated cardboard sheet is being manufactured successively, upon the splicing work it is necessary to carry out the work while stopping feed of the sheet for a pre-determined period of time. While the section having the function of supplementing the difference between the continuous consumption of the sheet on the demand side and the actually fed length of the sheet on the feed side during the stoppage, is the dancer roll section 1, upon splicing as the feed of the sheet is momentarily braked and stopped, the tension in the running sheet would rise abruptly as shown in Fig. 3(A) relating to the prior art, due to the inertia of the tension roll 5 in the dancer roll section 1. In addition, there were shortcomings that after the splicing, sagging was produced in the sheet or the tension in the sheet became extraordinarily high due to unbalance between the feed speed of the

BNSDOCID: <EP 0378721B1 I >

sheet and the moving speed of the tension roll 5. Consequently, the prior art system involved various problems that many troubles such as breaking, deformation and instability of running of the sheet were generated.

From WO-A-87/02019 there is known a device for processing endless web material with several processing stations at different operating speeds, in which the tension in a sheet unwound from a roll is intended to be kept within a required range by means of a loop supported roll round which the endless sheet material is fed in the form of a reserve loop and whose displacement is automatically controlled by the feed speed and the withdrawal speed of the endless sheet material with the aid of a computer. In this prior art device, however, stopping of the endless sheet does not occur during operation. Although this reference indicates the general possibility of using a differential gear for mechanically coupling the inlet and the outlet roll of the web accumulator, this reference does not describe specific parameters of such solution.

Document US-A-4,009,814 describes a web accumulator, in which for the purpose of avoiding tension in delicate sheets, all moving rolls within the dancer roll section are linked by an endless driving chain.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide a simplified and reliable continuous splicing system for paying out a rolled sheet and continuously feeding the sheet to a downstream machine without any time delays or variations in tension of the sheet between the diferent stages of the splicing process.

According to the present invention there is provided a splicing system for paying out a rolled sheet and continuously feeding the sheet to a downstream machine, said system including a sheet splicer for stopping the fed sheet and splicing a tip end of another new rolled sheet therewith, at least one tension roll provided in a dancer roll section, for forming at least one loop of the sheet trained around said tension roll downstream of said sheet splicer, said at least one tension roll being connected to a mechanism for shifting the tension roll within said dancer roll section, thereby feeding the sheet accumulated in said loop to the downstream machine to avoid variation of the tension in the sheet, an accelerating roll provided upstream of said dancer roll section and downstream of said sheet splicer, for decelerating/stopping and accelerating the sheet coming from the sheet splicer, a guide roll provided downstream of said dancer roll section and upstream of said machine, for feeding the sheet coming from said dancer roll section towards the machine, said guide roll, said accelerating roll and said mechanism for shifting the tension roll being mutually interconnected by means of differential planetary reduction gears, wherein said differential planetary reduction gears providing the following relation between a circumferential speed N3 of said guide roll, a circumferential speed N2 of said accelerating roll and a moving speed N1 of said shifting mechanism:

$$N_1 = \frac{(-N_2) + N_3}{L},$$

wherein L is a factor determined by the number of loops formed in the dancer roll sectionand indicating the multiple of the speed by which the accumulated sheet is fed from the loop upon a given moving speed of the at least one tension roll within the dancer roll section, wherein a positive number of N_1 represents a direction of shifting of said tension roll towards decreasing an amount of sheet accumulated in the loop of the dancer roll section, and said accelerating roll being controlled such that its circumferential speed N_2 is set slightly higher than the circumferential speed N_3 of said guide r[illegible] termined period of time following a decele[illegible] period of said accelerating roll during sp[illegible] a new rolled sheet to a decelerated/stopped rolled sheet, to increase an amount of sheet accumulated within the loop of the dancer roll section.

In a preferred embodiment of the splicing system one tension roll forming one loop within the dancer roll section is provided and thus the factor L is 2.

According to the present invention, owing to the above-described construction of the splicing system, the feed speed of the sheet delivered through the dancer roll section to a single facer or a double facer in the next step of the process is a speed corresponding to a manufacturing speed of a corrugated cardboard sheet. The guide roll continues to rotate at a circumferential speed corresponding to the manufacturing speed of the corrugated cardboard sheet, the circumferential speed of the accelerating roll is maintained nearly equal to the circumferential speed of the guide roll, and so, feeding of the sheet is effected with the tension roll positioned nearly at a fixed location. In the sheet splicing work, when the circumferential speed of the accelerating roll has been decelerated and stopped by controlling the speed of the accelerating motor and thereby feed of the raw material sheet from the mill roll stand has been stopped, the circumferential speed $(-N_2)$ of the accelerating roll becomes zero, hence from the relation of

$$N_1 = \frac{(-N_2) + N_3}{2},$$

the moving speed N_1 of the tension roll in the dancer roll section becomes

$$N_1 = \frac{N_3}{2} \text{ (because } \frac{N_2}{2} = 0\text{)},$$

and therefore, the tension roll moves at a speed of 1/2 times the sheet feed speed in the direction for reducing the sheet pool, so that the sheet pooled in the dancer roll section can be released without being accompanied by variation of the tension.

On the other hand, in the case where the sheet splicing has been finished and the sheet pooled in the dancer roll section is supplemented by accelerating the speed

BNSDOCID: <EP 0378721B1 I >

of the accelerating roll, also the tension roll moves in the opposite direction to that described above without generating variation of the tension in the sheet nor sagging of the sheet.

The above-mentioned and other objects, features and advantages of the present invention will become more apparent by reference to the following description of one preferred embodiment of the present invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the accompanying drawings:

Fig. 1(a) is a plan view of a splicing system according to one preferred embodiment of the present invention;
Fig. 1(b) is a side view of the same;
Fig. 2 is a cross-section front view of differential speed reduction gears employed in the system shown in Fig. 1;
Fig. 3(a) is a schematic view showing preset circumferential speeds of the respective portions in the illustrated embodiment;
Fig. 3(b) is a diagram showing a running behavior of a sheet and variations of a tension in the sheet upon splicing in the splicing system according to the present invention;
Fig. 3(c) is a diagram showing modes of variation of a tension in a sheet in the system known in the prior art and in the system according to the present invention;
Fig. 4(a) is a plan view of a splicing system in the prior art;
Fig. 4(b) is a side view of the same; and
Fig. 5 is a detailed partial side view showing an essential part in the system shown in Fig. 4(b).

DESCRIPTION OF THE PREFERRED EMBODIMENT:

In the following, the present invention will be described in more detail in connection to one preferred embodiment of the invention illustrated in Figs. 1, 2 and 3(a). It is to be noted that the respective circumferential moving speeds N_1, $(-N_2)$ and N_3 are defined so that moving speed in the direction of increasing the amount of the sheet stock in the dancer roll section 1 may be positive and that in the direction of decreasing the stock amount may be negative.

Now, in the dancer roll section 1, the route of a continuous sheet 2 passing through a sheet splicer not shown and running around an accelerating roll 4, a tension roll 5 and a delivery section guide roll 6, respectively, and the capability of stocking a necessary amount of sheet to be consumed during a splicing operation, are the same as those employed in the prior art system shown in Fig. 4. However, the preferred embodiment of the present invention illustrated in Fig. 1 has a characteristic feature in that drive for the accelerating roll 4, movement of the tension roll 5 in the dancer roll section 1 and drive for the delivery section guide roll 6 are mutually interlocked via differential speed reduction gears 7 to perform effective control.

The differential speed reduction gears 7 employed in one preferred embodiment of the present invention consists of a planetary gear mechanism as shown in Fig. 2, which comprises three rotary elements of a shaft 8, a flange 9 and a casing 10. In addition, in Fig. 2 reference characters A and D designate sun gears and reference characters B and C designate planet gears. As is well known by those skilled in the art, the relation among the circumferential speeds of the respective rotary elements that is, the shaft 8, the flange 9 and the casing 10 is represented by

$$N_1 = \frac{-N_2 + N_3}{2},$$

where symbol N_1 relates to the moving speed of the tension roll caused by the circumferential speed of the shaft 8, symbol $\frac{-N_2}{2}$ represents the circumferential speed of the flange 9, and symbol $\frac{N_3}{2}$ represents the circumferential speed of the casing 10.

Explaining now the construction and function of the dancer roll section 1, the dancer roll section 1 makes use of the differential reduction gears 7 which operate in the above-described manner, by rotating the shaft 8 the bearings 14 pivotably supporting the tension roll 5 in the dancer roll section 1 is reciprocated via a powder clutch 11, sprockets 12 and chains 13, the casing 10 is rotated at a circumferential speed of $\frac{N_3}{2}$ by transmitting the rotation (at the circumferential speed of N_3) of the sheet delivery section guide roll 6 thereto via power transmission means, and the flange 9 is rotated at a circumferential speed of $\frac{-N_2}{2}$ by transmitting the rotation (at the circumferential speed of $-N_2$) of the accelerating roll 4 that is driven by an accelerating motor 16 for controlling a sheet feeding state (deceleration, stoppage or acceleration) from a mill roll stand not shown, via power transmission means.

The running behavior of the sheet in the above-described system is shown in Fig. 3(b), in which the feed speed of the sheet delivered from the mill roll stand to the dancer roll section 1 normally coincides with the circumferential speed of the accelerating roll 4 (only upon splicing, a press roll 24 is pressed against the accelerating roll 4 by the action of a cylinder 25), and by making that sheet feed speed equal to or a little faster than the ejection speed of the sheet delivered from the guide roll 6 in the dancer roll section, the position of the tension roll 5 is set to be stopped or to be moved very slowly to the left as seen in Fig. 3(a).

In addition, the ejection speed of the sheet delivered through the dancer roll section 1 to a single facer or a double facer in the next step of the process is a speed corresponding to the manufacturing speed of the corrugated cardboard sheet, and so, the casing 10 of the differential speed reduction gears 7 would continue to

BNSDOCID: <EP 0378721B1 I >

rotate at a circumferential speed corresponding to the manufacturing speed of the corrugated cardboard sheet.

Accordingly upon sheet splicing, when the circumferential speed of the accelerating roll 4 has been decelerated and stopped via the accelerating motor 16 and thus the feed of the raw material sheet from the mill roll stand has been stopped, the shaft 8 would rotate in the reverse direction, and the tension roll 5 would move rightwards as viewed in Fig. 3(a). The moving speed of the tension roll 5 at that time would be

$$N_1 = \frac{N_3}{2} \text{ (because } \frac{N_2}{2} = 0),$$

in view of the relation of

$$N_1 = \frac{-N_2 + N_3}{2},$$

that is, the moving speed would become 1/2 times the sheet ejection speed, and so, the sheet pooled in the dancer roll section 1 can be released without being accompanied by variation of the tension in the sheet (Since the tension roll is moved rightwards at the speed of $\frac{N_3}{2}$, that is, at the speed equal to half times the sheet speed N_3, variation of the tension in the sheet is none at all.). Owing to the above-mentioned capability, abrupt increase of the tension in the sheet caused by the inertia of the tension roll 5 which was a shortcoming of the prior art system, can be eliminated, and a constant tension can be maintained.

After finishment of the splicing work, the circumferential speed of the accelerating roll 4 is increased via the accelerating motor 16, and the sheet feed speed from the mill roll stand 15 to the dancer roll section 1 is accelerated. Until the sheet feed speed coincide with the sheet ejection speed, according to the relation of

$$N_1 = \frac{-N_2 + N_3}{2},$$

the rightward moving speed of the tension roll 5 in the dancer roll section 1 is reduced by the amount corresponding to the increment of the sheet feed speed accelerated by the accelerating roll 4, and when the sheet feed speed and the sheet ejection speed coincides, the moving speed of the tension roll 5 becomes zero. Furthermore, the accelerating roll 4 is driven a little faster than the sheet ejection speed N_3, thus the tension roll 5 in the dancer roll section 1 is moved leftwards at the speed of

$$N_1 = \frac{-N_2 + N_3}{2},$$

and thereafter, a sheet length corresponding to the area of the hatched portion in Fig. 3(b) becomes an additionally supplemented amount of the sheet stock in the dancer roll section 1. It is to be noted that after the sheet capacity that can be stocked in the dancer roll section 1 has been completely supplemented, the accelerating roll 4 is brought into a freely rotatable state (i.e. an idling state), and the movement of the tension roll 5 is stopped by making the sheet feed speed and the sheet ejection speed coincide with each other.

In addition, as described already in connection with the prior art system in Fig. 4, the powder clutch 11 directly coupled to the shaft 8 can delicately control the tension in the delivered sheet by regulating the action force for moving the tension roll 5. In other words, the tension in the sheet delivered to a single-facer or a double-facer in the next step of the process is generated by a tension applied at the delivery section and a braking force in the inverse direction produced by a braking action at the accelerating roll, and upon extraordinary increase of the sheet tension, the clutch 11 is made to slip. Thus, this system operates to control the sheet tension so that it can be maintained always within a predetermined range.

It is to be noted that the present invention should not be limited only to the above-described embodiment, but various changes and modifications in design can be made without departing from the scope of the appended claims. For instance, when the speed on the sheet ejection side is represented by N_3, the speed on the deceleration/acceleration side is represented by $-N_2$, and the moving speed of the tension roll in the dancer roll section located therebetween is represented by N_1, the respective speed N_1, $-N_2$ and N_3 can be controlled by individual motors so as to fulfil the relation of

$$N_1 = \frac{-N_2 + N_3}{2}.$$

In other words, by driving the tension roll in the dancer roll section at a moving speed N_1 which fulfils the relation of

$$N_1 = \frac{-N_2 + N_3}{2},$$

an excessive sheet tension and sagging of the sheet can be eliminated. While the above explanation was made for the example of a single dancer (a single tension roll is provided), in the case of a double dancer (two tension rolls are provided), the same effect can be obtained by driving the tension rolls so as to fulfil the relation of

$$N_1 = \frac{-N_2 + N_3}{4}.$$

Since the splicing system according to the present invention is constructed as described above, in the event that upon a sheet splicing work, the circumferential speed of the accelerating roll has been reduced and running of the old sheet has been stopped, the tension roll in the dancer roll section can be moved towards the sheet ejection side so as to slacken the sheet tension in response to the deceleration and stoppage, while upon acceleration of the new sheet after the splicing, the moving speed of the tension roll can be reduced, stopped and reversed (so as to move in the opposite direction to the sheet ejection side), and thereby abrupt increase and decrease of the sheet tension generated upon every splicing work as described above, can be mitigated.

BNSDOCID: <EP 0378721B1 I >

Thereby, the problems to be resolved in the prior art such as breaking, deformation and running instability of the sheet, can be resolved. Accordingly, degradation of a productivity accompanying generation of troubles such as sheet breaking or the like, can be eliminated, moreover, variation of the tension is eliminated, and manufacturing of high-quality corrugated cardboard sheets is possible.

Claims

1. A splicing system for paying out a rolled sheet (2) and continuously feeding the sheet (2) to a downstream machine, said system including

   a sheet splicer (3) for stopping the fed sheet (2) and splicing a tip end of another new rolled sheet (2') therewith,

   at-least one tension roll (5) provided in a dancer roll section (1), for forming at least one loop of the sheet trained around said tension roll (5) downstream of said sheet splicer (3), said at least one tension roll (5) being connected to a mechanism for shifting the tension roll (5) within said dancer roll section (1), thereby feeding the sheet accumulated in said loop to the downstream machine to avoid variation of the tension in the sheet (2),

   an accelerating roll (4) provided upstream of said dancer roll section (1) and downstream of said sheet splicer (3), for decelerating/stopping and accelerating the sheet (2) coming from the sheet splicer (3),

   a guide roll (6) provided downstream of said dancer roll section (1) and upstream of said machine, for feeding the sheet (2) coming from said dancer roll section (1) towards the machine,

   said guide roll (6), said accelerating roll (4) and said mechanism for shifting the tension roll (5) being mutually interconnected by means of differential planetary reduction gears (7), wherein said differential planetary reduction gears (7) providing the following relation between a circumferential speed N3 of said guide roll (6), a circumferential speed N2 of said accelerating roll (4) and a moving speed N1 of said shifting mechanism:

$$N_1 = \frac{(-N_2) + N_3}{L},$$

   wherein L is a factor determined by the number of loops formed in the dancer roll section (1) and indicating the multiple of the speed by which the accumulated sheet (2) is fed from the loop upon a given moving speed of the at least one tension roll (5) within the dancer roll section (1), wherein a positive number of N_1 represents a direction of shifting of said tension roll (5) towards decreasing an amount of sheet (2) accumulated in the loop of the dancer roll section (1), and

   said accelerating roll (4) being controlled such that its circumferential speed N_2 is set slightly higher than the circumferential speed N_3 of said guide roll (6) for a predetermined period of time following a decelerated/stopping period of said accelerating roll (4) during splicing of a new rolled sheet (2') to a decelerated/stopped rolled sheet (2), to increase an amount of sheet (2,2') accumulated within the loop of the dancer roll section (1).

2. The splicing system of claim 1, wherein one tension roll (5) forming one loop within the dancer roll section (1) is provided and wherein the factor L is 2.

Patentansprüche

1. Verbindungs- bzw. Spleißsystem zum Absculen einer aufgerollten Bahn (2) und zum kontinuie Zuführen der Bahn (2) zu einer nachgesch Machine, welches System umfaßt:

   einen Bahnspleißer (3) zum Anhalten der zugeführten Bahn (2) und zum Verbinden bzw. Spleißen eines Vorderendes einer anderen, neuen, aufgerollten Bahn (2') damit,

   mindestens eine in einer Tänzerwalzensektion (1) vorgesehene Spannwalze (5) zum Bilden mindestens einer Schleife der um die Spannwalze (5) herumgeführten Bahn an einer dem Bahnspleißer (3) nachgeschalteten Stelle, wobei die mindestens eine Spannwalze (5) mit einem Mechanismus zum Verschieben der Spannwalze (5) innerhalb der Tänzerwalzensektion (1) verbunden ist, um damit die in der Schleife angesammelte Bahn unter Vermeidung von Änderung oder Schwankung der Zugspannung in der Bahn (2) der nachgeschalteten Maschine zuzuführen,

   eine der Tänzerwalzensektion (1) vorgeschaltet und dem Bahnspleißer (3) nachgeschaltet vorgesehene Beschleunigungswalze (4) zum Verzögern/Anhalten und Beschleunigen der vom Bahnspleißer (3) ankommenden Bahn (2), (und)

   eine der Tänzerwalzensektion (1) nachgeschaltet und der Maschine vorgeschaltet vorgesehene Führungswalze (6) zum Zuführen der von der Tänzerwalzensektion (1) ankommenden Bahn (2) in Richtung auf die Maschine,

   wobei die Führungswalze (6), die Beschleunigungswalze (4) und der Mechanismus zum Verschieben der Spannwalze (5) durch ein Differentialplaneten(rad)untersetzungsgetriebe (7) miteinander verbunden sind, welches Differentialplaneten(rad)untersetzungsgetriebe (7) zwischen einer Umfangsgeschwindigkeit N_3 der Führungswalze (6), einer Umfangsgeschwindigkeit N_2 der Beschleunigungswalze (4) und einer Bewegungsgeschwindigkeit N1 des Verschiebemechanismus die folgende Beziehung gewährleistet:

$$N_1 = \frac{(-N_2) + N_3}{L},$$

BNSDOCID: <EP 0378721B1 I >

worin bedeutet: L = ein durch die Zahl von in der Tänzerwalzensektion (1) gebildeten Schleifen bestimmter und das Mehrfache der Geschwindigkeit, mit welcher die angesammelte Bahn (2) bei einer gegebenen Bewegungsgeschwindigkeit der mindestens einen Spannwalze (5) innerhalb der Tänzerwalzensektion (1) von der Schleife zugeführt wird, angebender Faktor, wobei eine positive Zahl von N_1 eine Verschiebungsrichtung der Spannwalze (5) in Richtung einer Verkleinerung der in der Schleife der Tänzerwalzensektion (1) angesammelten Menge an Bahn (2) repräsentiert, und

wobei die Beschleunigungswalze (4) so geregelt oder gesteuert wird, daß ihre Umfangsgeschwindigkeit N_2 geringfügig höher eingestellt ist als die Umfangsgeschwindigkeit N_3 der Führungswalze (6) für eine vorbestimmte Zeitspanne nach einer Verzögerungs/Anahlteperiode der Beschleunigungswalze (4) während des Spleißens einer neuen aufgerollten Bahn (2') mit einer verzögerten/angehaltenen aufgerollten Bahn (2), um (damit) eine in der Schleife der Tänzerwalzensektion (1) angesammelte Menge an Bahn (2, 2') zu vergrößern.

2. Spleißsystem nach Anspruch 1, wobei eine Spannwalze (5) zur Bildung einer Schleife in der Tänzerwalzensektion (1) vorgesehen und der Faktor L gleich 2 ist.

Revendications

1. Un système de raccordement pour dévider une feuille bobinée (2) et pour délivrer en continu la feuille (2) à une machine aval, ledit système comportant

un dispositif (3) de raccordement de feuilles pour arrêter la feuille délivrée (2) et raccorder avec celle-ci l'extrémité libre d'une autre feuille nouvelle bobinée (2'),

au moins un rouleau de tension (5) prévu dans une section (1) à rouleau danseur, pour former au moins une boucle de la feuille entraînée autour dudit rouleau de tension (5) en aval dudit dispositif (3) de raccordement de feuilles, ledit rouleau de tension (5) étant relié à un mécanisme pour décaler le rouleau de tension (5) dans ladite section (1) à rouleau danseur, de manière à délivrer la feuille accumulée dans ladite boucle à la machine aval pour éviter une variation de la tension de la feuille (2),

un rouleau d'accélération (4) prévu en amont de ladite section (1) à rouleau danseur et en aval dudit dispositif (3) de raccordement de feuilles, pour décélérer/arrêter et accélérer la feuille (2) provenant du dispositif (3) de raccordement de feuilles,

un rouleau de guidage (6) prévu en aval de ladite section (1) à rouleau danseur et en amont de ladite machine, pour délivrer la feuille (2) provenant de ladite section (1) à rouleau danseur vers la machine,

ledit rouleau de guidage (6), ledit rouleau d'accélération (4) et ledit mécanisme pour décaler le rouleau de tension (5) étant mutuellement interconnectés au moyen de pignons (7) de réduction planétaire différentielle, lesdits pignons (7) de réduction planétaire différentielle fournissant la relation suivante entre la vitesse circonférencielle N_3 dudit rouleau de guidage (6), la vitesse circonférencielle N_2 dudit rouleau d'accélération (4) et la vitesse N_1 de déplacement dudit mécanisme de décalage :

$$N_1 = \frac{(-N_2) + N_3}{L},$$

L étant un facteur déterminé par le nombre de boucles formées dans la section (1) à rouleau danseur et indiquant le multiple de la [illegible] lequel la bande accumulée (2) est déli[illegible] de la boucle pour une vitesse de déplac[illegible] née du rouleau de tension (5) dans la s[illegible] (1) à rouleau danseur, une valeur positive de N_1 représentant une direction de décalage dudit rouleau de tension (5) vers une diminution de la quantité de feuille (2) accumulée dans la boucle de la section (1) à rouleau danseur, et

ledit rouleau d'accélération (4) étant commandé de telle manière que sa vitesse circonférencielle N_2 soit établie pour être légèrement supérieure à la vitesse circonférencielle N_3 dudit rouleau de guidage (6) pendant une durée prédéterminée suivant une période de décélération/arrêt dudit rouleau d'accélération (4) lors du raccordement d'une nouvelle feuille bobinée (2') à une feuille bobinée décélérée/arrêtée (2), pour augmenter la quantité de feuille (2,2') accumulée dans la boucle de la section (1) à rouleau danseur.

2. Le dispositif de raccordement de la revendication 1, dans lequel il est prévu un seul rouleau de tension (5) formant une boucle dans la section (1) à rouleau danseur, et dans lequel le facteur L vaut 2.

BNSDOCID: <EP 0378721B1 I >

Fig. 1

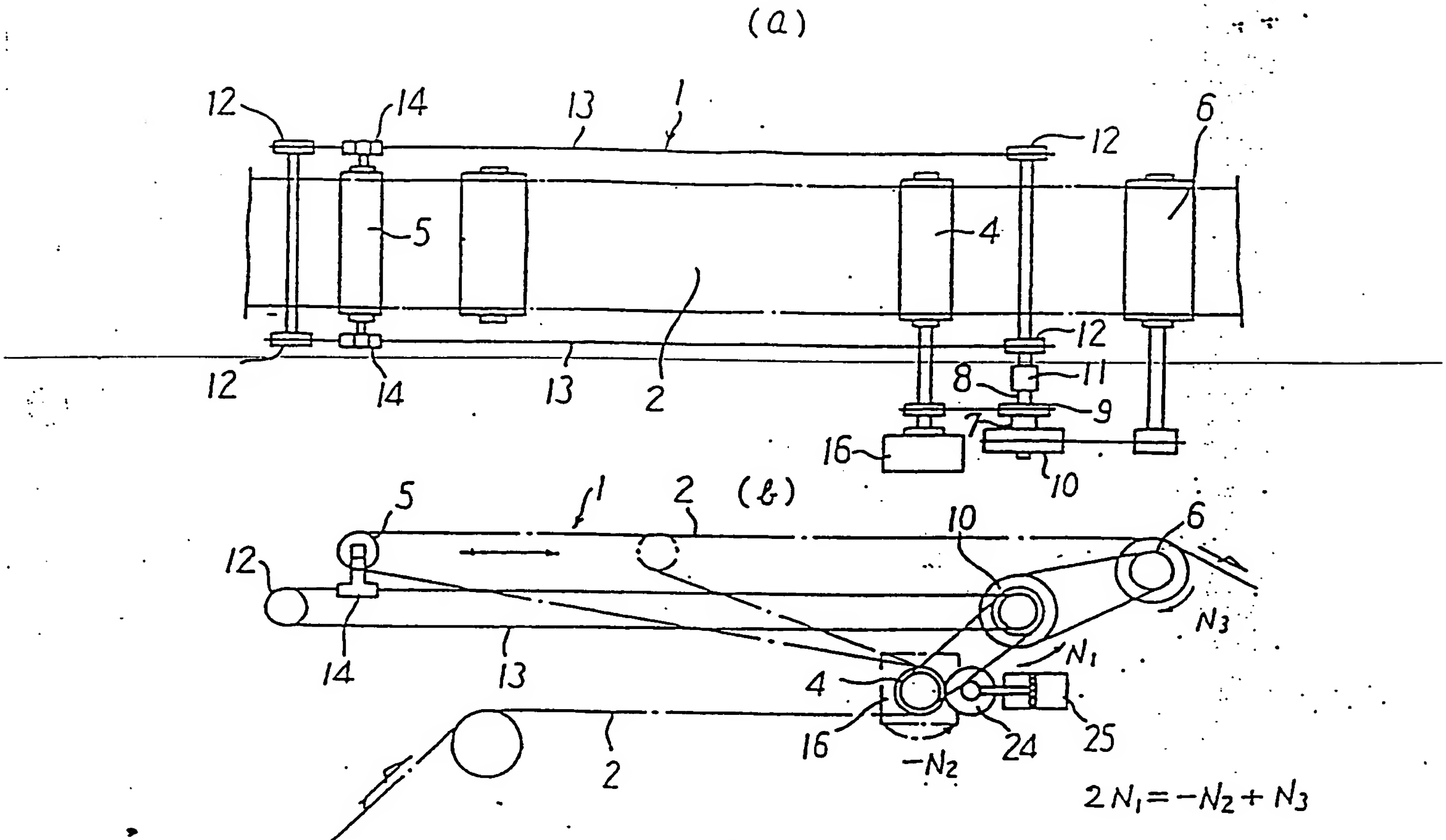

(a)
12
14
13
1
12
6
5
4
2
12
14
13
2
12
8
11
9
7
16
10
(b)
5
1
2
10
6
12
14
13
N3
N1
4
16
24
25
2
-N2
2N1=-N2+N3

Fig. 2

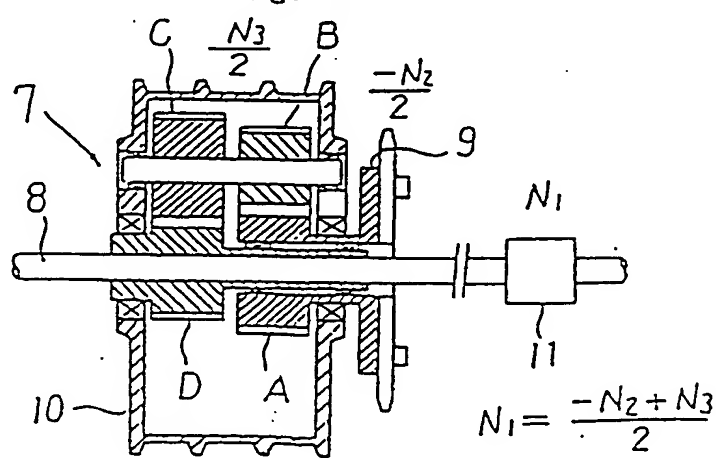
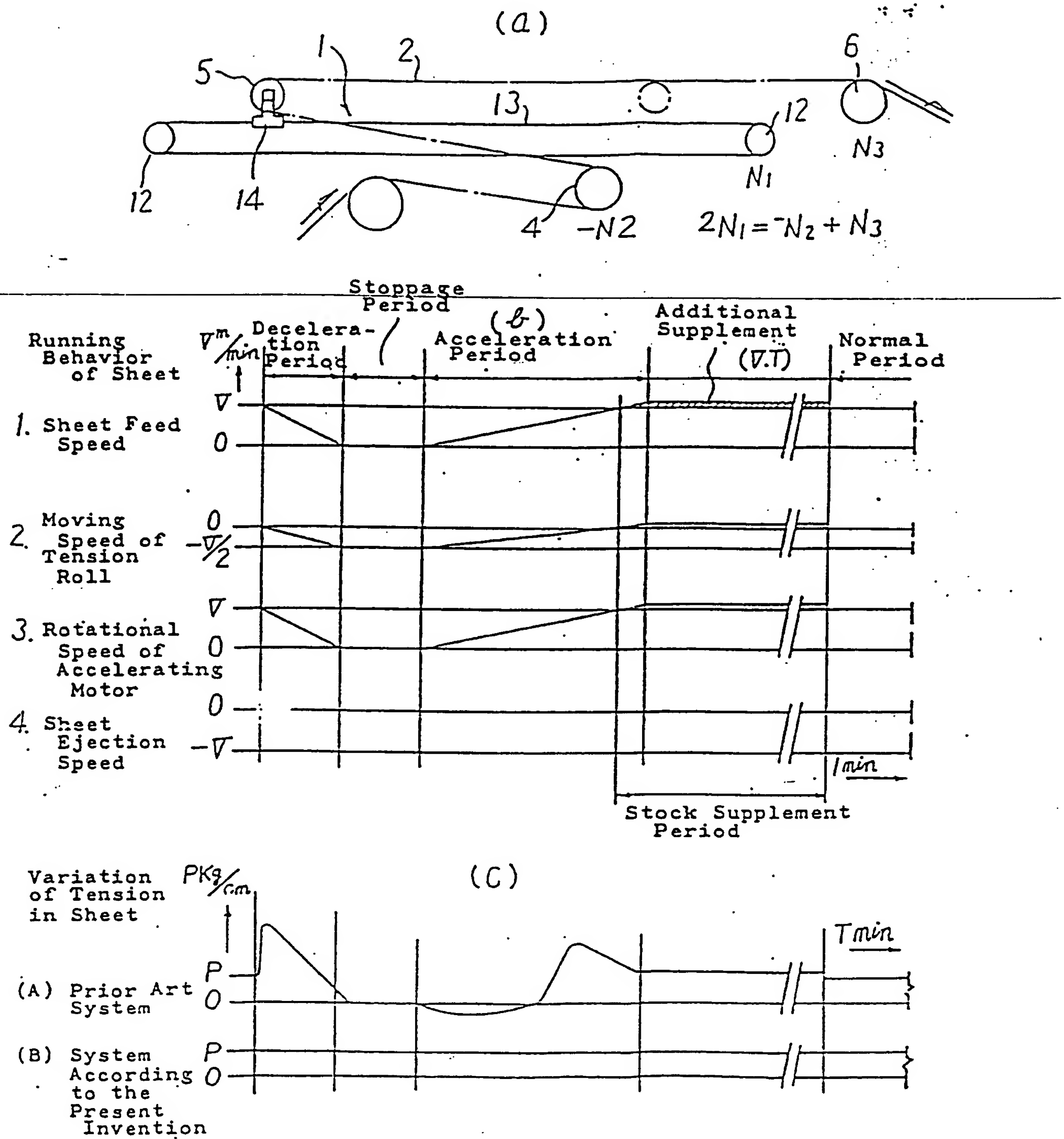
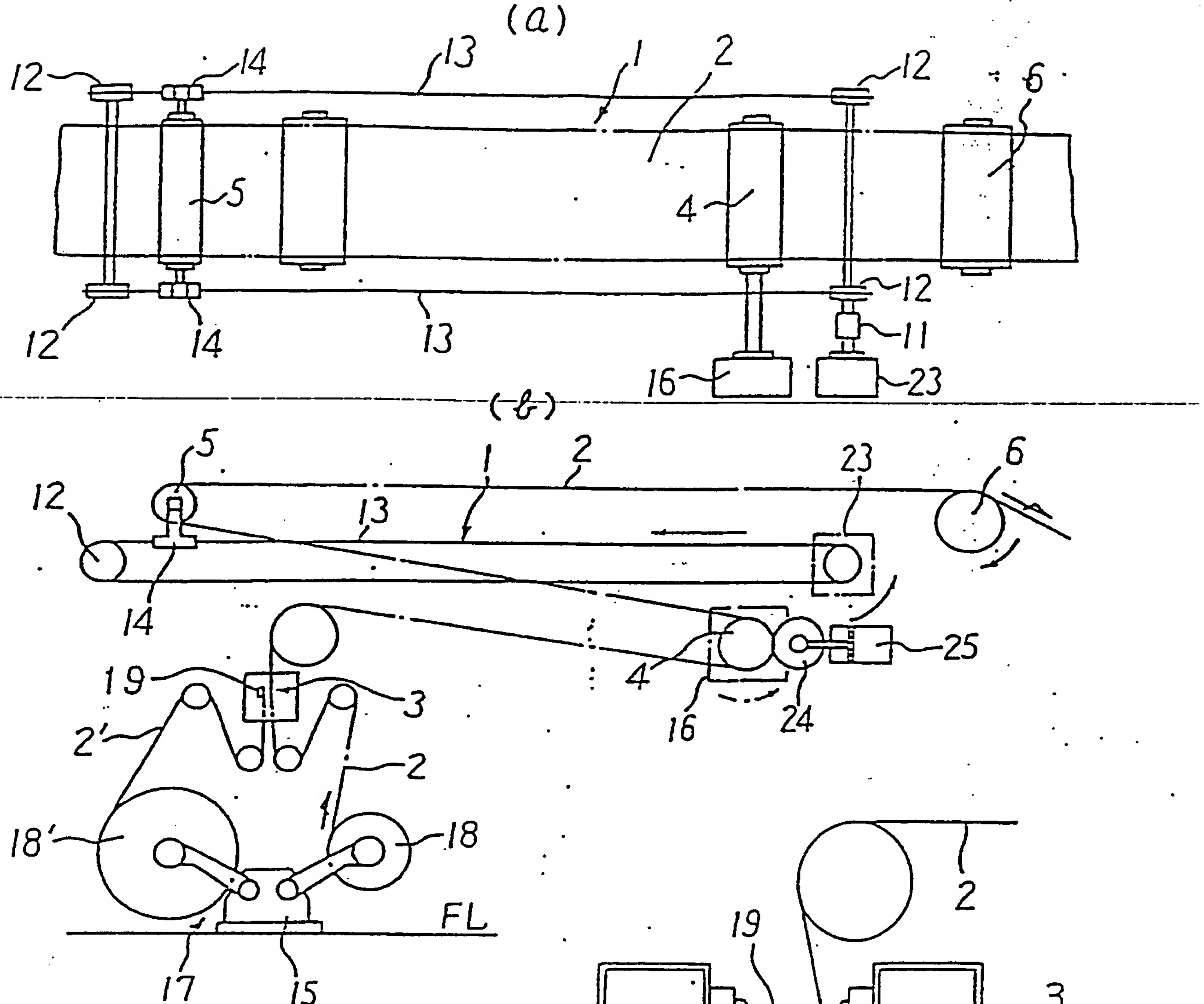

C
N3/2
B
-N2/2
7
9
8
N1
11
10
D
A
N1= (-N2+N3)/2

Fig. 3



BNSDOCID: <EP 0378721B1 I >

Fig. 4 (Prior Art)



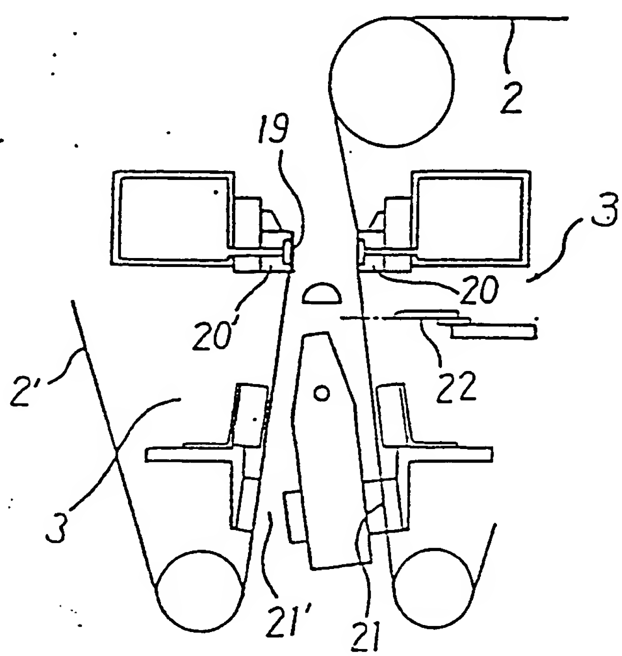


Fig. 5
(Prior Art)

BNSDOCID: <EP 0378721B1 I >

Record - 33 (c)1996 Derwent Info Ltd. All rts. reserv.

Titolo: **Slicing system for cardboard sheet_stops running sheet and tension roll for feeding running sheet without changing speed of downstream machine**

P. Assignee:	(MITO) MITSUBISHI JUKOGYO				
Author:	SATO H				
Patent Family:	CC Number	Kind	Date	Week	
	US 4929297	A	900529	9025	(Basic)
	EP 378721	A	900725	9030	
	EP 378721	B1	960410	9619	
	DE 68926229	E	960515	9625	
	ES 2085262	T3	960601	9629	

Priority:	CC Number	Date
	US 301101	890125
	EP 89100876	890119
	DE 626229	890119
	EP 89100876	890119
	EP 89100876	890119
	EP 89100876	890119

EP WO Lang.: English
Cited Patents: FR 2117449 / FR 2222294 / FR 2341507 / GB 2056953 / US 4009814 / WO 8702019
Design. States: (National):DE / ES / FR / GB
Filing Details: ES2085262_Based on_ EP 378721 / DE68926229_Based on_ EP 378721

Riassunto: *US 4929297 _ The splicing system includes a sheet splicer for stopping a running sheet and splicing a tip end of another new sheet. A tension roll in a dancer roll section for forming a sheet pool downstream of that sheet splicer. The tension roll is provided for the purpose of feeding the running sheet without changing the speed of the downstream machine. An accelerating roll for stopping a running old sheet and accelerating the new sheet upstream of the dancer roll section and downstream of the sheet splicer. A guide roll provided downstream of the dancer roll section and upstream of the downstream machine for feeding the sheet coming from the dancer roll section to the downstream machine. When a rotational speed of the accelerating roll is represented by -N2, a rotational speed of the guide roll is represented by +N3, and a rotational speed of a drive shaft for moving the tension roll in the dancer roll section is represented by N1. The drive shaft is driven so as to fulfil the relation of N1 equals ((-N2)+N3) divided by 2 and thereby variation of the tension in the sheet applied to the tension roll accompanying the variation of*

the rotational speed of the accelerating roll can be made zero. USE - For paying out a rolled sheet and continuously feeding a sheet to a downstream machine. @(9pp Dwg.No.3a/5)@

Riassunto: *9619 EP 378721 _B A spicing system for paying out a rolled sheet (2) and continuously feeding the sheet (2) to a downstream machine, said system including a sheet splicer (3) for stopping the fed sheet (2) and splicing a tip end of another new rolled sheet (2') therewith, at least one tension roll (5) provided in a dancer roll section (1), for forming at least one loop of the sheet trained around said tension roll (5) downstream of said sheet splicer (3), said at least one tension roll (5) being connected to a mechanism for shifting the tension roll (5) within said dancer roll section (1), thereby feeding the sheet accumulated in said loop to the downstream machine to avoid variation of the tension in the sheet (2), an accelerating roll (4) provided upstream of said dancer roll section (1) and downstream of said sheet splicer (3), for decelerating/stopping and accelerating the sheet (2) coming from the sheet splicer (3), a guide roll (6) provided downstream of said dancer roll section (1) and upstream of said machine, for feeding the sheet (2) coming from said dancer rolls section (1) towards the machine, said guide roll (6), said accelerating roll (4) and said mechanism for shifting the tension roll (5) being mutually interconnected by means of differential planetary reduction gears (7), wherein said differential planetary reduction gears (7) providing the following relation between a circumferential speed N3 of said guide roll (6), a circumferential speed N2 of said accelerating roll (4) and a moving speed N1 of said shifting mechanism: wherein L is a factor determined by the number of loops formed in the dancer roll section (1) and indicating the multiple of the speed by which the accumulated sheet (2) is fed from the loop upon a given moving speed of the at least one tension roll (5) within the dancer roll section (1), wherein a positive number of N1 represents a direction of shifting of said tension roll (5) towards decreasing an amount of sheet (2) accumulated in the loop of the dancer roll section (1), and said accelerating roll (4) being controlled such that its circumferential speed N2 is set slightly higher than the circumferential speed N3 of said guide roll (6) for a predetermined period of time following a decelerated/stopping period of said accelerating roll (4) during splicing of a new rolled sheet (2') to a decelerated/stopped rolled sheet (2), to increase an amount of sheet (2,2') accumulated within the loop of the dancer roll section (1). Dwg.1a,b/3*

Derwent Class.: Q36

Int. Classif.: B65H-019/14 / B65H-019/16

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☑ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☑ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: ______________________

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.